

METHOD AND APPARATUS FOR HIGH EFFICIENCY EVAPORATION OPERATION

ABSTRACT

A process for treatment of an aqueous stream to produce a low solute containing distillate stream and a high solute/solids containing blowdown stream utilizing a method to increase the efficiency of an evaporator while providing an essentially scale free environment for the heat transfer surface. Multi-valent ions and non-hydroxide alkalinity are removed from aqueous feed streams to very low levels and then the pH is increased preferably to about 9 or higher to increase the ionization of low ionizable constituents in the aqueous solution. In this manner, species such as silica and boron become highly ionized, and their solubility in the concentrated solution that is present in the evaporation equipment is significantly increased. The result of this is high allowable concentration factors and a corresponding increase in the recovery of high quality reusable water with essentially no scaling.